station the maximum amount in spring falls between 6h. and 8h. p.m., while the greatest frequency occurs between 8h. and 10h. a.m. ; in summer the maximum amount occurs between 2h. and 8h. p.m., and the greatest frequency between 2h. and 4h. p.m. In winter there are two maxima of quantity, 8h. to 10h. a.m. and 6h. to 8h. p.m., while the time of greatest frequency coincides with first period.

"SOLOID" microscopic stains prepared by Messrs. Burroughs, Wellcome and Co. are aniline and other dyes in a tabloid form easily dissolved in water or alcohol or both, as the case may require, and therefore most useful. They are easily preserved, always ready and portable. The list at present published includes a great variety of the most generally used dyes, as hæmatoxylin, eosin, eosin and methylenblue, fuchsin, gentian violet, thionine blue, &c. While admitting, from direct tests made with some of these soloids, their usefulness, it should not be forgotten that, like other short cuts, also the "Soloid" short cut should only supply a necessity, but should not, and cannot, supplant the recognised labqratory methods. The dye marked "Louis Jenner stain" (eosin and methylenblue) is a good eosin but a bad methylenblue stain, and cannot for a moment compare with Czinzinski's solution (eosin and methylblue.) Pages 3 and 4 of the leaflet issued with the soloids, containing descriptions of methods of staining bacilli and blood, may be safely omitted.

IN a series of five papers published during the last few months in the *Journal of Physiology*, Dr. H. M. Vernon has described numerous observations on the zymogens and enzymes of the pancreas. The method used for estimating the tryptic power of extracts depends on the digestion of measured quantities of finely chopped fibrin in small graduated centrifugal tubes. The process is completed in about half an hour, and the average error of experiment is only 5 to 10 per cent. The necessity of adopting a rapid digestion method is shown by the fact, hitherto not adequately recognised, that the tryptic ferment is an extraordinarily unstable body. Thus 70 to 80 per cent. of the ferment in a very active extract may be destroyed in an hour by ·4 per cent. Na_2CO_3 at 38°. If such extracts be kept for weeks they gradually deteriorate in activity, and the trypsin still remaining undestroyed is found to be a more and more stable body, till finally the last portions of the ferment left may be ten or twenty times more stable than the first. It was accordingly concluded that trypsin is not a single substance, but that there must exist series of trypsins of varying degrees of stability. There are likewise series of rennins, but not of diastases, though is was shown that the diastatic ferments of the pancreas, of saliva and of malt differ from each other considerably in their hydrolysing action on starch. As regards the zymogens, it was found that the rennet ferment has a zymogen very similar to that of the tryptic ferment, whilst the zymogen of the diastatic ferment is an insoluble body. The most energetic agent in the conversion of tryptic zymogen into enzyme was found to be active enzyme itself. Thus if even 1 per cent. of an active extract were added to a solution of zymogen at 38°, it might convert a third of it into enzyme in an hour. Curiously, the rennet ferment was likewise liberated from its zymogen by the tryptic ferment, and not by the rennetic.

MESSRS. BLACKIE AND SON have commenced the issue of a cheap edition of Kerner and Oliver's "Natural History of Plants," which is well known to all students of plant life. The work will be published in sixteen monthly parts at eighteen pence each, and is thus brought within the means of everyone who is interested in the study of botany. Used either as a guide or a reference book, the work is appreciated by all who know it, and it deserves a sphere of influence even greater than that it already possesses.

WE are glad to learn, from the *Bulletin* of the St. Petersburg Society of Naturalists, that the herbarium of "Flora Rossica," which was begun by the late M. S. I. Korzinsky, member of the St. Petersburg Academy of Sciences, continues to be issued by the Academy under the supervision of M. D. I. Litwinow. Six more fascicules (xiii.–xviii.) appeared lately, together with one fascicule of "Schedæ Herbarium Floræ Rossicæ." We also learn from the same source that M. P. V. Syuzev has undertaken the publication of a "Flora Uralensis exsiccata." This herbarium will comprise chiefly the flora of the province of Perm, but also of Ufa and Orenburg.

A WORK on "The Narym Region," by M. A. Th. Plotnikoff (*Memoirs* of the Russian Geographical Society, Statistics, vol. x. St. Petersburg, 1901), contains a valuable description of a very interesting portion of the province of Tomsk, namely, the portion on the water-divide between the Ob and the Irtysh, as also on the rivers Ket, Parabel and Vas'yugan, which represents mostly an immense marsh—to a great extent a lake during the period of high water in the rivers—and the surface of which is covered with a floating carpet of decayed grass and knolls of ground upon which low bushes of birch will grow. A general description of this wide region (about 100,000 sq. miles) and of its nearly 8000 inhabitants—Russians, Ostyaks and Ostyak-Samoyedes—is given by the author, who has for several years resided at Narym.

ABOUT seventeen years ago, Prof. Salvatore Sardo extracted from the siliquæ of *Bignonia Catalpa* an acid which he called catalpic acid, and to which he assigned the formula $C_{14}H_{14}O_6$. A reinvestigation of the products of the Catalpa fruit has now been made by Signor A. Piutti and Dr. E. Comanducei, whose results are described in the *Rendiconto* of the Naples Academy, viii. 3, Instead, however, of obtaining an acid with the formula assigned by Sardo, they obtained from the immature pods a substance corresponding to the formula $C_7H_6O_3$, which is shown by numerous evidence to be identical with *p*-oxybenzoic acid. In addition they have extracted what appears to be a combination of paroxybenzoic acid and protocatechuic acid, previously obtained in other ways by Hlasiwetz and Barth, having the formula $C_7H_6O_3$, $C_7H_6O_4+2H_2O$, but the attempt to separate the two acids has hitherto ended in negative results, although the other acid appears to have been isolated by Eykman from the fruits of *Illicium religiosum*. Many questions suggest themselves as to the state in which these acids occur in the Catalpa fruit, and whether they are free or in combination, and it is proposed to collect a quantity of the fruits for further observation.

THE additions to the Zoological Society's Gardens during the past week include a Lesser White-nosed Monkey (*Cercopithecus petaurista*) from West Africa, presented by Sir William Hoste ; a Mozambique Monkey (*Cercopithecus pygerythrus*) from East Africa, presented by Mr. J. Bolt; a Common Viper (*Vipera berus*) European, presented by Mr. C. Spencer Bubb ; a Hartebeest (*Bubalis*, sp. inc.) from Angola, purchased ; two Japanese Deer (*Cervus sika*) born in the Gardens.

OUR ASTRONOMICAL COLUMN.

SATURN VISIBLE THROUGH THE CASSINI DIVISION.—An interesting circular has been issued by Mr. C. T. Whitmell, of Leeds, calling attention to the possibility of this phenomenon being observed. On July 17, 1902, at 13h. G.M.T., Saturn will be in opposition to the sun, and about 7h. G.M.T. on that day the earth and sun will be equally elevated above the ring plane, their Saturnicentric declination being about 22° 26′ 17″ N. Adopting Prof. Barnard's estimate of 2270 miles for the breadth of the Cassini division, and fifty miles for the thickness of the rings, Mr. Whitmell calculates that the effective opening of the division will be 820 miles, corresponding to 0″·20 in angular

measure at the earth's distance. Under these conditions a line from the sun to the earth will pass through the rift in the rings to the planet, and a terrestrial observer, suitably placed, may be able to view through the rift a portion of the planet's surface lit up by the sunlight. The effect will be that, of the arc of the Cassini division crossing the planet, a small portion will appear bright instead of dark, and may almost disappear; as the albedo of Saturn is less than that of the adjacent portions of rings A and B, however, it is likely that there will be sufficient contrast to show the phenomenon.

There appears to be no record of any previous observation of this kind, and it will obviously be one of great delicacy and difficulty. As the exact limits of time and place are not absolutely determinable, it is hoped that the planet will be watched for some time before the date given.

CATALOGUE OF NORTH POLAR STARS.—Prof. Pickering has issued a catalogue of 589 stars in the vicinity of the North Pole as a separate part, No. 1., of vol. xlviii. of the *Annals of the Harvard College Observatory*. The measures are from enlargements made from the central portions of four negatives obtained with the 11-inch Draper telescope on November 29, 1887, February 23, 24 and March 10, 1897, with exposures of 60, 120, 120 and 101 minutes respectively. Full details are given of the reductions employed, and in consequence of the arrangements made at the Astrophotographic Congress of 1900, the positions are published in rectangular coordinates, which plan is to be adopted in general for future issues.

THERMAL EXPANSIONS AT LOW TEMPERATURES.[1]

THE apparent specific gravities of boiling liquid oxygen which resulted from weighing in the liquid a series of metals and other substances were given in a lecture entitled "New Researches on Liquid Air," printed in the Royal Institution *Proceedings* for 1896. For instance, silver, calc spar, rock crystal and iodide of silver gave the respective apparent densities 1·1278, 1·1352, 1·1316 and 1·1372. On correcting the weight of liquid displaced by each substance for contraction to −182°·6—by calculating a Fizeau mean coefficient of expansion for the range of temperature employed, on the assumption that the parabolic formula might be legitimately extended to low temperatures—it was found that the real density of liquid oxygen so deduced for all the bodies used was, as a mean, 1·137.

The determination of the densities of substances at the temperature of the boiling point of oxygen—and hence of their mean coefficients of expansion between that temperature and ordinary temperatures—opens out a very large field of investigation, from which, if a sufficiently large number of observations were available, valuable deductions might be drawn. On account, however, of the expense and trouble of producing quantities of liquid oxygen, its use for this purpose is not likely to become general, although, when available, it is the easiest body to use in conducting such experiments, especially when the vacuum vessel containing it is immersed in a larger vessel containing the same fluid or well-evaporated air. The ease with which liquid air can now be obtained in many laboratories suggests that its application to work of this kind would in some cases be a convenience, and the present investigation was undertaken with the desire of ascertaining what accuracy could be attained, and how the method could be applied to inorganic or organic substances which occur in the form of fine crystals.

The use of a mixture of varying composition and density like liquid air necessitates a determination of its density with accuracy and rapidity before and during the course of the experiments. For this purpose, in the experiments about to be detailed, the liquid air that had been allowed to evaporate for twenty-four hours in advance was used in large silver-coated vacuum vessels of some 3 litres capacity. In order to ascertain the density of the liquid, a polished silver ball, which had been weighed once for all in liquid oxygen, was weighed in the sample of liquid air, and from the relative weights thus found the density of the liquid air could be approximately determined, assuming that of liquid oxygen to be 1·137.[2] To prevent any disturbing ebullition in the liquid-air flask in which the weighings took place, and to reduce the rate of its evaporation to a minimum during the course of an experiment, the substance to be used was previously cooled in a supplementary vessel containing liquid air and then transferred to the large flask. To avoid as far as possible the formation of cracks in the bodies during the process of immersion in the liquid air, it was found advisable to cool them slowly in the air of the vacuum flask first, and then to lower them into the liquid.

In this way, with proper care and attention, results were obtained comparable in accuracy with the density taken in liquid oxygen. Substances like solid carbonic acid and ice were weighed in the cool, gaseous air of the vacuum vessel, and their weights subsequently corrected for buoyancy. The temperature of the densest and lightest samples of liquid air was ascertained by the hydrogen thermometer, and that of the others deduced by graphic interpolation. As the entire range of temperature through which the bodies were cooled amounted to about 200°, a degree or two up or down has no real influence on the results; the extreme range of temperature in the air samples was from 83°·8 to 86°·1 Abs.

When the body to be examined was a salt, it was employed in the form of a compressed block. One experiment was, however, made in a section of a large crystal of chrome alum. The salt, previously reduced to a fine powder, was moistened with water and compressed in a cylindrical steel mould under great hydraulic pressure. During compression the saturated salt solution drained away, and finally a cylindrical block of some 50 grammes of the salt was obtained free from porosity and hard enough to allow its surface to be polished. In this form salts and other materials similarly treated are especially adapted for accurate specific gravity determinations. After such treatment it was found that all the mechanically attached water was got rid of in the case of hydrated salts, and also in such as did not combine with water. In order to get cylindrical blocks of the salts showing no porosity, the presence of water, or rather the saturated salt solution, was found to be essential during the application of pressure. In the same way it was found to be an advantage in compressing such a substance as solid carbonic acid to moisten it with a fluid like ether before applying the hydraulic pressure.

Recalling the work of Playfair and Joule,[1] which originated in a suggestion of Dalton's that the volume of a hydrated salt in solution was simply the volume of the water of crystallisation, ice and some hydrated salts were selected, as well as some other bodies the coefficients of expansion of which they had determined. Substances of special interest were included in the list, like mercury, sulphur, iodine and solid carbonic acid, the latter being particularly important as an example of a solidified gas.

In the further conduct of an experiment, the observations made on a substance were three, namely, (*a*) the weight in grammes of the substance and suspending platinum wire, either in air of about 17° C. temperature or in the gaseous air in the flask containing the liquid air; (*b*) the weight in grammes of the body and wire when immersed in the liquid air; and (*c*) the weight in grammes of the suspending platinum wire in ordinary (17°) air.

In the case of substances of less density than liquid air, a polished copper ball weighing about 38 grammes was used as a sinker.

Two experiments were made on compressed cylinders of solid carbonic acid. In the first of these the carbonic acid was compressed dry, in the second, after a few drops of ether were added. The specific gravities of solid mercury, iodine and sulphur were also determined in liquid air. The iodine was in the form of a compressed cylinder, but the sulphur was a piece of a crystalline mass of native origin.

The specific gravity of the actual portion of the substance weighed in the liquid air was, with one or two exceptions, determined also at the temperature of the laboratory, about 17° C. From the two sets of observations, the value of the mean coefficient of cubical expansion between 17° C. and the temperature of liquid air was calculated.

In calculating coefficients of expansion, various forms may be given to the formula employed, and correspondingly different results may be obtained from the same set of observations. For short ranges of temperature these results are practically identical, but this no longer holds for a range of temperature such as we

[1] "Coefficients of the Cubical Expansion of Ice, Hydrated Salts, Solid Carbonic Acid, and other Substances at Low Temperatures." By Prof. James Dewar, F.R.S. Abridged from a paper read before the Royal Society on May 1.

[2] As the correction due to the contraction of the silver ball between the temperature of boiling oxygen and that of the air sample is small, it may be neglected.

[1] "Researches on Atomic Volume and Specific Gravity" (*Chem. Soc. Journ.*, vol. i., 121).